



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 102367AF		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NO00/00103	International filing date (day/month/year) 22/03/2000	Priority date (day/month/year) 22/03/1999	
International Patent Classification (IPC) or national classification and IPC H02K1/12			
Applicant LYNG MOTOR AS et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 3 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 18/10/2000		Date of completion of this report 29.06.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer van der Haegen, D Telephone No. +49 89 2399 2683 	

Form PCT/IPEA/409 (cover sheet) (January 1994)

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ATTACHMENT F

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NO00/00103

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-8 as originally filed

Claims, No.:

1-12 as received on 27/02/2001 with letter of 27/02/2001

Drawings, sheets:

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NO00/00103

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Yes:	Claims 1-12
	No:	Claims
Inventive step (IS)	Yes:	Claims
	No:	Claims 1-12
Industrial applicability (IA)	Yes:	Claims 1-12
	No:	Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NO00/00103

Re Item V

Reasoned statement under Article 35(2) PCT with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

D1 : EP 0 588 478 A2 (LYNG ELEKTRONIKK AS) 23 March 1994 and,
D2 : WO 95/12912 (STRIDSBERG INNOVATION AB) 11 May 1995 .

2.1 Document D1 discloses (cf. Figures 8-10) a stator element (30, 35) suitable for use in a rotating electric machine, the stator element (30, 35) comprising :

- a single pole piece (25, 27),
- a single flux-conducting section (24, 26) integrally formed with the single pole piece and
- a coil core (8) lying adjacent to the single flux-conducting section (24, 26) and being separate from the integral piece formed by the single pole piece and the single flux-conducting section.

Furthermore, D1 discloses that said stator element (30, 35) consists of a number of laminated metal sheets (cf. column 6, lines 5-11).

2.2 The subject-matter of claim 1 only differs from document D1 in that the stator element is an **integral, solid** piece comprising a single pole piece, a single flux conducting section **and a coil core part**.

2.3 The problem to be solved by the claim 1 may therefore be regarded as to reduce the number of components making up a stator, thereby facilitating the mounting of the stator into an electric machine.

2.4 It is well-known to those skilled in the art that mounting coil cores in rotating electric machines, laminating stator elements and mounting the laminated stator elements next to a coil core in an electric machine is a difficult and expensive task.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NO00/00103

Document D2 discloses (cf. Figure 3) a pole piece, a flux-conducting section and a coil core part forming together an integral stator element. Furthermore, D2 shows that such a stator element can be produced as a solid element (cf. page 7, lines 19-21). It would therefore be obvious for the skilled person, confronted with the technical problem and with the disclosures of document D2 to integrate pole piece, flux-conducting section and coil core part of the stator element of D1 into one solid and integral element in order to solve the problem posed. The subject-matter of claim 1 does not, therefore, involve an inventive step in the sense of Article 33(3) PCT.

- 3.1 The features introduced by the subject-matter of claim 2 do not add any matter that involves an inventive step (cf. paragraph 2.1).
- 3.2 The feature of claim 3 is a matter of normal design procedure. Its inclusion in the stator part described in document D1 would therefore be an obvious design possibility for the skilled person. The subject-matter of claim 3 does not, therefore, add any matter that involves an inventive step (Article 33(3) PCT).
- 3.3 The production of the stator part from heat-treated and pressure-formed iron powder is known from document D2 (cf. page 7, lines 19-21). The skilled person would therefore regard it as a normal design option to include this feature in the stator part described in document D1 in order to solve the problem posed. The subject-matter of claims 4 and 9 does not add any matter that involves an inventive step (Article 33(3) PCT).
- 3.4 Claims 5 and 6 include all the features of claim 1. Hence, it follows that the subject-matter of claims 5 and 6 does not involve an inventive step in the sense of Article 33(3) PCT.
- 3.5 The features introduced by the subject-matter of claims 7, 8, 11 and 12 are a matter of normal design procedure and are well-known in the art. Its inclusion in the stator part described in document D1 would therefore be an obvious design possibility for the skilled person. The subject-matter of claims 7, 8, 11 and 12 does not, therefore, add any matter that involves an inventive step (Article 33(3) PCT).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NO00/00103

- 3.6 Claim 10 includes all the features of claims 5 or 6. Consequently, it follows that the subject-matter of claim 10 does not involve an inventive step in the sense of Article 33(3) PCT.
4. Claims 1-12 meet the requirements of Article 33(4) PCT.

Re Item VII**Certain defects in the international application**

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.
2. In view of figure 3, it appears that the equation on page 5, line 21 of the description should read " $B \approx 2C$ ".

Re Item VIII**Certain observations on the international application**

1. The expression "... preferably of the transverse flux type ..." has no limiting effect on the scope of claims 1, 5, 6 and 10. This feature is regarded as entirely optional (see PCT International Preliminary Examination Guidelines, III-4.6).

1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 00/00103

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H02K 1/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3868521 A (VOLKER SCHLICHER ET AL), 25 February 1975 (25.02.75), column 5, line 48 - column 9, line 28	1-2,4
Y	---	3,5-12
X	EP 0568347 A1 (MINEBEA KABUSHIKI-KAISHA), 3 November 1993 (03.11.93), column 1, line 4 - column 2, line 49	1,2,4
Y	---	3,5-12

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 July 2000

Date of mailing of the international search report

26 -07- 2000

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Telephone No. +46 8 782 25 00

2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 00/00103

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4794292 A (AKIRA TORISAWA), 27 December 1988 (27.12.88), column 7, line 34 - column 9, line 17	1,2,4
Y	--	3,5-12
Y	WO 9512912 A1 (STRIDSBERG INNOVATION AB), 11 May 1995 (11.05.95), page 4, line 39 - page 5, line 8	3,5-12
A	EP 0588478 A2 (LYNG ELEKTRONIKK A-S), 23 March 1994 (23.03.94), abstract	1-12

INTERNATIONAL SEARCH REPORT
 Information on patent family members

02/12/99

International application No.

PCT/NO 00/00103

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3868521 A	25/02/75	DE 2147982 A	29/03/73
		JP 1263648 C	16/05/85
		JP 48072601 A	01/10/73
		JP 59034053 B	20/08/84
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US 4794292 A	27/12/88	JP 63242159 A	07/10/88
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		JP 7036689 B	19/04/95
		JP 63028256 A	05/02/88
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		SE 9303602 D	00/00/00
		BR 9406582 A	02/01/96
		EP 0682576 A	22/11/95
		JP 8506619 T	16/07/96
		SE 9400076 D	00/00/00
		US 5902373 A	11/05/99
		SE 9401524 D	00/00/00
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		AT 146019 T	15/12/96
		DE 69306344 D,T	12/06/97
		DK 588478 T	26/05/97
		ES 2097983 T	16/04/97
		NO 174947 B,C	25/04/94
		NO 922844 D	00/00/00
		US 5369324 A	29/11/94

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 16 November 2000 (16.11.00)	
International application No. PCT/NO00/00103	Applicant's or agent's file reference 102367AF
International filing date (day/month/year) 22 March 2000 (22.03.00)	Priority date (day/month/year) 22 March 1999 (22.03.99)
Applicant LYNG, Ragnar	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 18 October 2000 (18.10.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Claudio Borton Telephone No.: (41-22) 338.83.38
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DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 00/00103

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"&" document member of the same patent family

Date of the actual completion of the international search

18 July 2000

Date of mailing of the international search report

26 -07- 2000

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 00/00103

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	WO 9512912 A1 (STRIDSBERG INNOVATION AB), 11 May 1995 (11.05.95), page 4, line 39 - page 5, line 8	3,5-12
A	EP 0588478 A2 (LYNG ELEKTRONIKK A-S), 23 March 1994 (23.03.94), abstract	1-12
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02/12/99

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				DE	69306344 D,T	12/06/97
				DK	588478 T	26/05/97
				ES	2097983 T	16/04/97
				NO	174947 B,C	25/04/94
				NO	922844 D	00/00/00
				US	5369324 A	29/11/94

**REPLACED BY
ART 34 AMDT****C L A I M S**

1. A stator element for use in a rotating electric machine that is preferably of the transverse flux type,
c h a r a c t e r i z e d i n that said stator element is constructed having a pole
5 piece (1), a flux-conducting section (2) and a coil core part (3) integral as one
piece, with the flux-conducting section (2) between the pole piece (1) and the coil
core part (3).
2. The stator element of claim 1,
10 c h a r a c t e r i z e d i n that said pole piece (1) has an elongate shape in a di-
rection parallel to the machine axis, with a length approximately twice the length of
the coil core part (3) in the same direction, the flux-conducting section (2) being
perpendicular to the pole piece (1) as well as the coil core part (3), and being atta-
15 ched to an end of each respective thereof, in such a manner that both pole piece
(1) and coil core part (3) point in the same direction.
3. The stator element of claim 1 or 2,
c h a r a c t e r i z e d i n that said coil core part (3) has an angular span of
360°/n in the rotation direction, n indicating the number of peripherally juxtaposed
20 stator elements that together can constitute a complete stator part.
4. The stator element of claim 1, 2 or 3,
c h a r a c t e r i z e d i n that it is shaped from pressure-formed and heat-treated
iron powder material.
- 25 5. A stator part for use in a rotating electric machine that is preferably of the
transverse flux type,
c h a r a c t e r i z e d i n that it is constituted by a number n of stator elements
of the type indicated in one of claims 1-4, arranged in an annular structure so that
30 n parallel pole pieces (1) point finger-like in a direction parallel to the rotation axis
of the machine and are situated radially on the outside or in the inside, while the
corresponding n coil core parts (3) are situated radially on the inside or on the out-
side to constitute together at least part of a coil core, and all n flux-conducting sec-
tions (2) are situated on the same axial side of the coil core.

6. A stator part for use in a rotating electric machine that is preferably of the transverse flux type, comprising an annular structure consisting of

- a coil core ring to support an annular coil (4) with a radial and an axial extent,

- a flux-conducting area extending radially from a coil core ring edge to a radial position somewhat past the radial extent of the coil (4),

- a number n of separate pole pieces (11, 21) extending in an axial direction from the flux-conducting area at said radial position thereof and in a direction back across the coil (4),

characterized in that

- said annular structure (11, 21, 12, 22, 13, 23) is constituted by an assembly of several peripherally juxtaposed and separately manufactured stator elements, each being an integral unit having

- at least one pole piece (11, 21),

- one flux-conducting section (12, 22) for every pole piece, all of these n sections (12, 22) constituting together said flux-conducting area, and

- one coil core part (13, 23), said coil core parts (13, 23) laying closely adjacent to each other and constituting together said coil core ring, and in

that

- every flux-conducting section (12, 22) is shaped in such a manner that there is a clear opening between neighbouring sections all the way from the coil core part (13, 23) to the pole piece (11, 21).

7. The stator part of claim 6,

characterized in that the pole pieces (11) are arranged radially on the outside, whereby the machine is of the type having an external rotor.

8. The stator part of claim 6,

characterized in that the pole pieces (21) are arranged radially on the inside, whereby the machine is of the type having an internal rotor.

9. The stator part of claim 6, 7 or 8,
c h a r a c t e r i z e d i n that every stator element is shaped from iron powder
material that is press cast and heat treated.

5 10. A stator for use in a rotating electric machine that is preferably of the trans-
verse flux type, comprising at least one pair of annular stator parts and at least
one coil (4), two stator parts in a pair being arranged axially juxtaposed on the
same axis and having pole pieces (1, 11, 21) pointing in opposite directions and in
between each other in a regular and interleaved manner, so as to form equally
10 large, open flux gaps between all $2n$ pole pieces (1, 11, 21), and the coil (4) being
situated in an annular space formed between the two stator parts in the pair,
c h a r a c t e r i z e d i n that the stator parts are like and of a type such as sta-
ted in claim 5 or 6, the coil core parts (3, 13, 23) together constituting a core for
the coil (4), insulated from the coil (4) by means of a substantially annular support
15 structure (28) for the stator part, made e.g. from a plastic material.

11. The stator of claim 10,
c h a r a c t e r i z e d i n that the pole pieces (1, 11) are arranged radially on the
outside, whereby the machine is of the type having an external rotor.

20

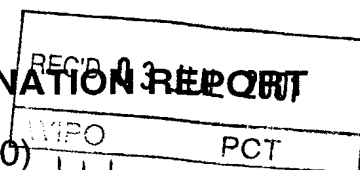
12. The stator of claim 10,
c h a r a c t e r i z e d i n that the pole pieces (21) are arranged radially on the
inside, whereby the machine is of the type having an internal rotor.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference 102367AF		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/NO00/00103	International filing date (day/month/year) 22/03/2000	Priority date (day/month/year) 22/03/1999
International Patent Classification (IPC) or national classification and IPC H02K1/12		
Applicant LYNG MOTOR AS et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 18/10/2000	Date of completion of this report 29.06.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer van der Haegen, D Telephone No. +49 89 2399 2683 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NO00/00103

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-8 as originally filed

Claims, No.:

1-12 as received on 27/02/2001 with letter of 27/02/2001

Drawings, sheets:

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NO00/00103

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-12
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-12
Industrial applicability (IA)	Yes:	Claims	1-12
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item V

Reasoned statement under Article 35(2) PCT with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

D1 : EP 0 588 478 A2 (LYNG ELEKTRONIKK AS) 23 March 1994 and,
D2 : WO 95/12912 (STRIDSBERG INNOVATION AB) 11 May 1995 .

2.1 Document D1 discloses (cf. Figures 8-10) a stator element (30, 35) suitable for use in a rotating electric machine, the stator element (30, 35) comprising :

- a single pole piece (25, 27),
- a single flux-conducting section (24, 26) integrally formed with the single pole piece and
- a coil core (8) lying adjacent to the single flux-conducting section (24, 26) and being separate from the integral piece formed by the single pole piece and the single flux-conducting section.

Furthermore, D1 discloses that said stator element (30, 35) consists of a number of laminated metal sheets (cf. column 6, lines 5-11).

2.2 The subject-matter of claim 1 only differs from document D1 in that the stator element is an **integral, solid** piece comprising a single pole piece, a single flux conducting section **and a coil core part**.

2.3 The problem to be solved by the claim 1 may therefore be regarded as to reduce the number of components making up a stator, thereby facilitating the mounting of the stator into an electric machine.

2.4 It is well-known to those skilled in the art that mounting coil cores in rotating electric machines, laminating stator elements and mounting the laminated stator elements next to a coil core in an electric machine is a difficult and expensive task.

Document D2 discloses (cf. Figure 3) a pole piece, a flux-conducting section and a coil core part forming together an integral stator element. Furthermore, D2 shows that such a stator element can be produced as a solid element (cf. page 7, lines 19-21). It would therefore be obvious for the skilled person, confronted with the technical problem and with the disclosures of document D2 to integrate pole piece, flux-conducting section and coil core part of the stator element of D1 into one solid and integral element in order to solve the problem posed. The subject-matter of claim 1 does not, therefore, involve an inventive step in the sense of Article 33(3) PCT.

- 3.1 The features introduced by the subject-matter of claim 2 do not add any matter that involves an inventive step (cf. paragraph 2.1).
- 3.2 The feature of claim 3 is a matter of normal design procedure. Its inclusion in the stator part described in document D1 would therefore be an obvious design possibility for the skilled person. The subject-matter of claim 3 does not, therefore, add any matter that involves an inventive step (Article 33(3) PCT).
- 3.3 The production of the stator part from heat-treated and pressure-formed iron powder is known from document D2 (cf. page 7, lines 19-21). The skilled person would therefore regard it as a normal design option to include this feature in the stator part described in document D1 in order to solve the problem posed. The subject-matter of claims 4 and 9 does not add any matter that involves an inventive step (Article 33(3) PCT).
- 3.4 Claims 5 and 6 include all the features of claim 1. Hence, it follows that the subject-matter of claims 5 and 6 does not involve an inventive step in the sense of Article 33(3) PCT.
- 3.5 The features introduced by the subject-matter of claims 7, 8, 11 and 12 are a matter of normal design procedure and are well-known in the art. Its inclusion in the stator part described in document D1 would therefore be an obvious design possibility for the skilled person. The subject-matter of claims 7, 8, 11 and 12 does not, therefore, add any matter that involves an inventive step (Article 33(3) PCT).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NO00/00103

- 3.6 Claim 10 includes all the features of claims 5 or 6. Consequently, it follows that the subject-matter of claim 10 does not involve an inventive step in the sense of Article 33(3) PCT.
4. Claims 1-12 meet the requirements of Article 33(4) PCT.

Re Item VII

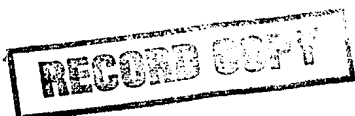
Certain defects in the international application

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.
2. In view of figure 3, it appears that the equation on page 5, line 21 of the description should read " $B \approx 2C$ ".

Re Item VIII

Certain observations on the international application

1. The expression "... preferably of the transverse flux type ..." has no limiting effect on the scope of claims 1, 5, 6 and 10. This feature is regarded as entirely optional (see PCT International Preliminary Examination Guidelines, III-4.6).




1/4

2000 - 42
PCT/NO 00/00103
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PCT REQUEST

Original (for SUBMISSION) - printed on 22.03.2000 10:41:40 AM

0	For receiving Office use only	
0-1	International Application No.	PCTNO 00/00103
0-2	International Filing Date	22 MARS 2000 (22.03.00)
0-3	Name of receiving Office and "PCT International Application"	 PATENTSTYRET Styret for det industrielle rettsvern ► PCT International application
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared using	PCT-EASY Version 2.90 (updated 08.03.2000)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	Norwegian Patent Office (RO/NO)
0-7	Applicant's or agent's file reference	102367AF
I	Title of invention	STATOR IN ROTATING ELECTRIC MACHINE
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	LYNG MOTOR AS
II-5	Address:	N-7125 VANVIKAN Norway
II-6	State of nationality	NO
II-7	State of residence	NO
III-1	Applicant and/or inventor	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	LYNG, Ragnar
III-1-5	Address:	N-7125 VANVIKAN Norway
III-1-6	State of nationality	NO
III-1-7	State of residence	NO

PCT REQUEST

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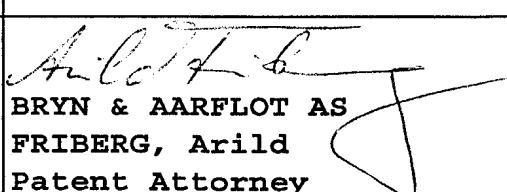
Original (for SUBMISSION) - printed on 22.03.2000 10:41:40 AM

IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	BRYN & AARFLOT AS
IV-1-2	Address:	P.O.BOX 449 SENTRUM N-0104 OSLO Norway
IV-1-3	Telephone No.	+47 22 00 31 00
IV-1-4	Facsimile No.	+47 22 00 31 31
IV-1-5	e-mail	EMAIL@BAA.NO
V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT AU AZ BA BB BG BR BY CA CH&LI CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	

PCT REQUEST

102367AF

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V-6	Exclusion(s) from precautionary designations	NONE	
VI-1	Priority claim of earlier national application		
VI-1-1	Filing date	22 March 1999 (22.03.1999)	
VI-1-2	Number	1999 1395	
VI-1-3	Country	NO	
VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	International Searching Authority Chosen	Swedish Patent Office (ISA/SE)	
VII-2	Request to use results of earlier search; reference to that search		
VII-2-1	Date	19 July 1999 (19.07.1999)	
VII-2-2	Number	1999 1395	
VII-2-3	Country (or regional Office)	NO	
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	8	-
VIII-3	Claims	3	-
VIII-4	Abstract	1	102367abs.txt
VIII-5	Drawings	8	-
VIII-7	TOTAL	24	
VIII-8	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Copy of Official Action	-
VIII-18	Figure of the drawings which should accompany the abstract	4	
VIII-19	Language of filing of the international application	Norwegian	
IX-1	Signature of applicant or agent		
IX-1-1	Name	BRYN & AARFLOT AS	
IX-1-2	Name of signatory	FRIBERG, Arild	
IX-1-3	Capacity	Patent Attorney	

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10-1	Date of actual receipt of the purported international application	22 MARS 2000 (22.03.00)
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	Received
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	

PCT REQUEST

102367AF

Original (for SUBMISSION) - printed on 22.03.2000 10:41:40 AM

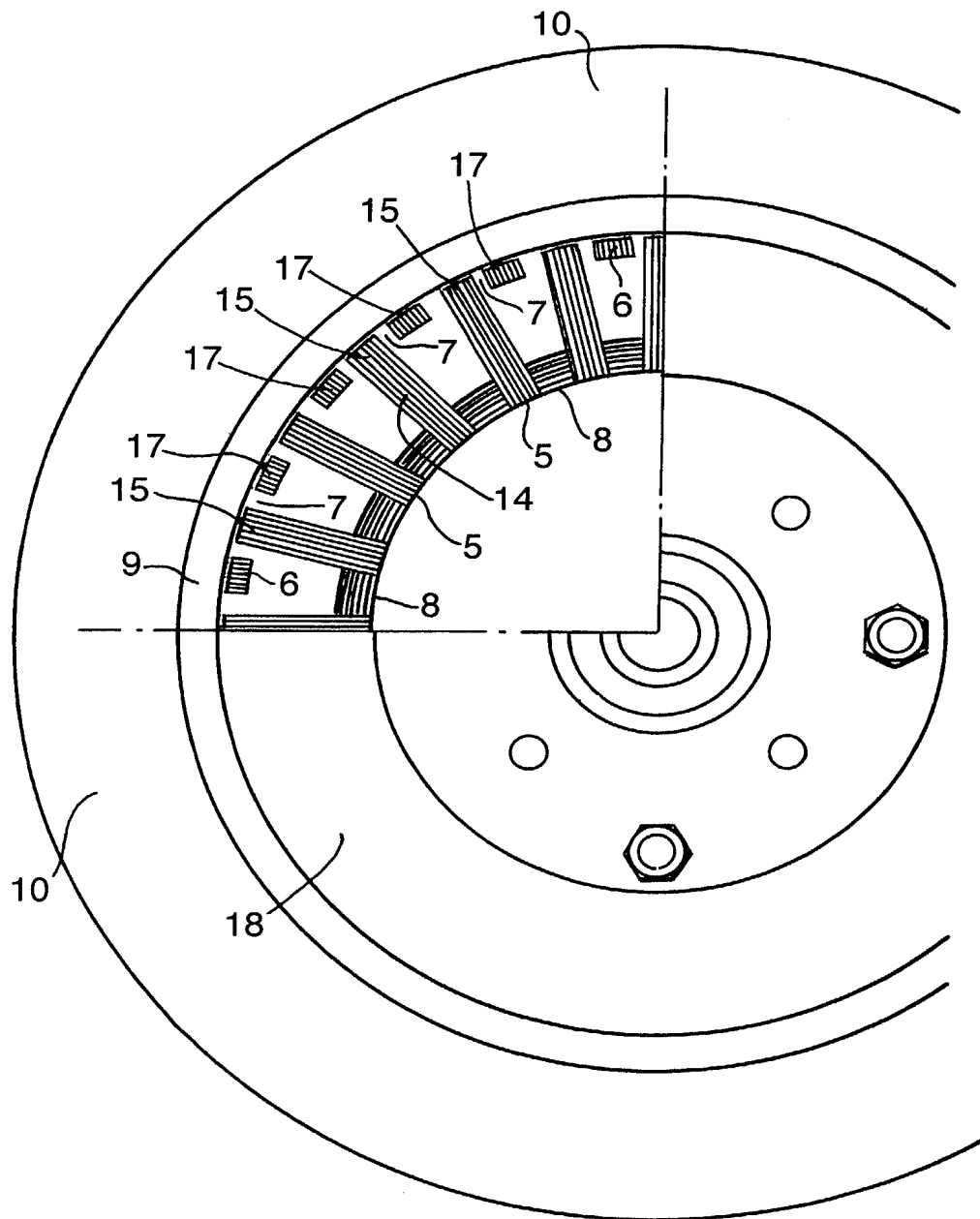
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/SE
10-6	Transmittal of search copy delayed until search fee is paid	

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11-1	Date of receipt of the record copy by the International Bureau	04 APRIL 2000	(04. 04. 00)
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1/6

Fig. 1.
(PRIOR ART)



2/6

Fig.2.
 (PRIOR ART)

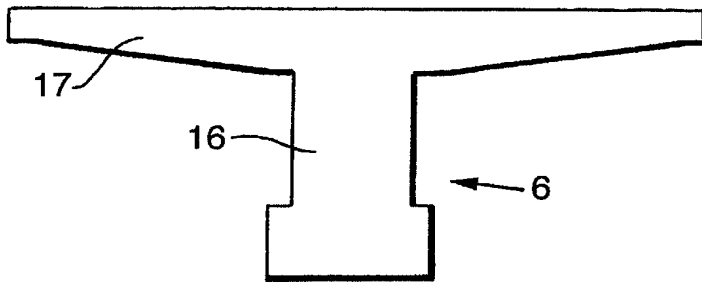


Fig.3.
 (PRIOR ART)

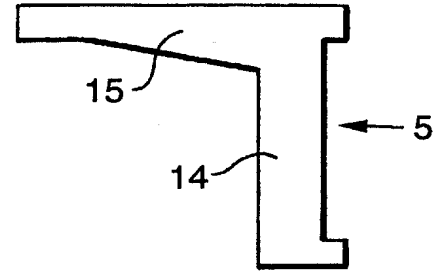


Fig.4.

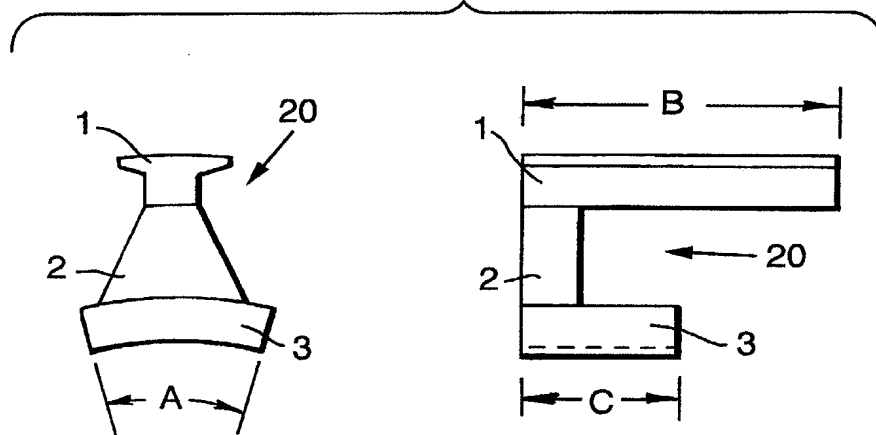
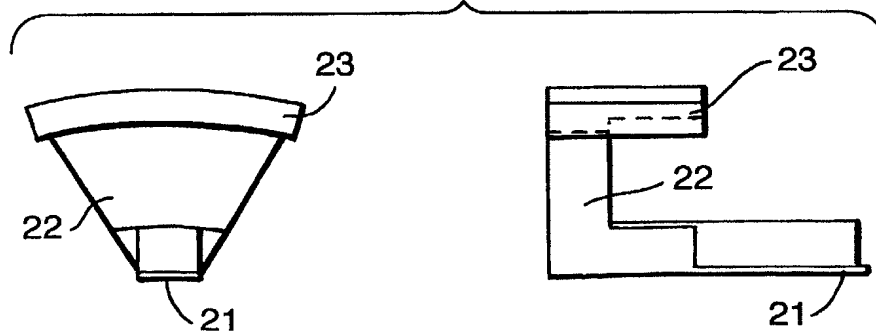


Fig.7.



3/6

Fig.5a.

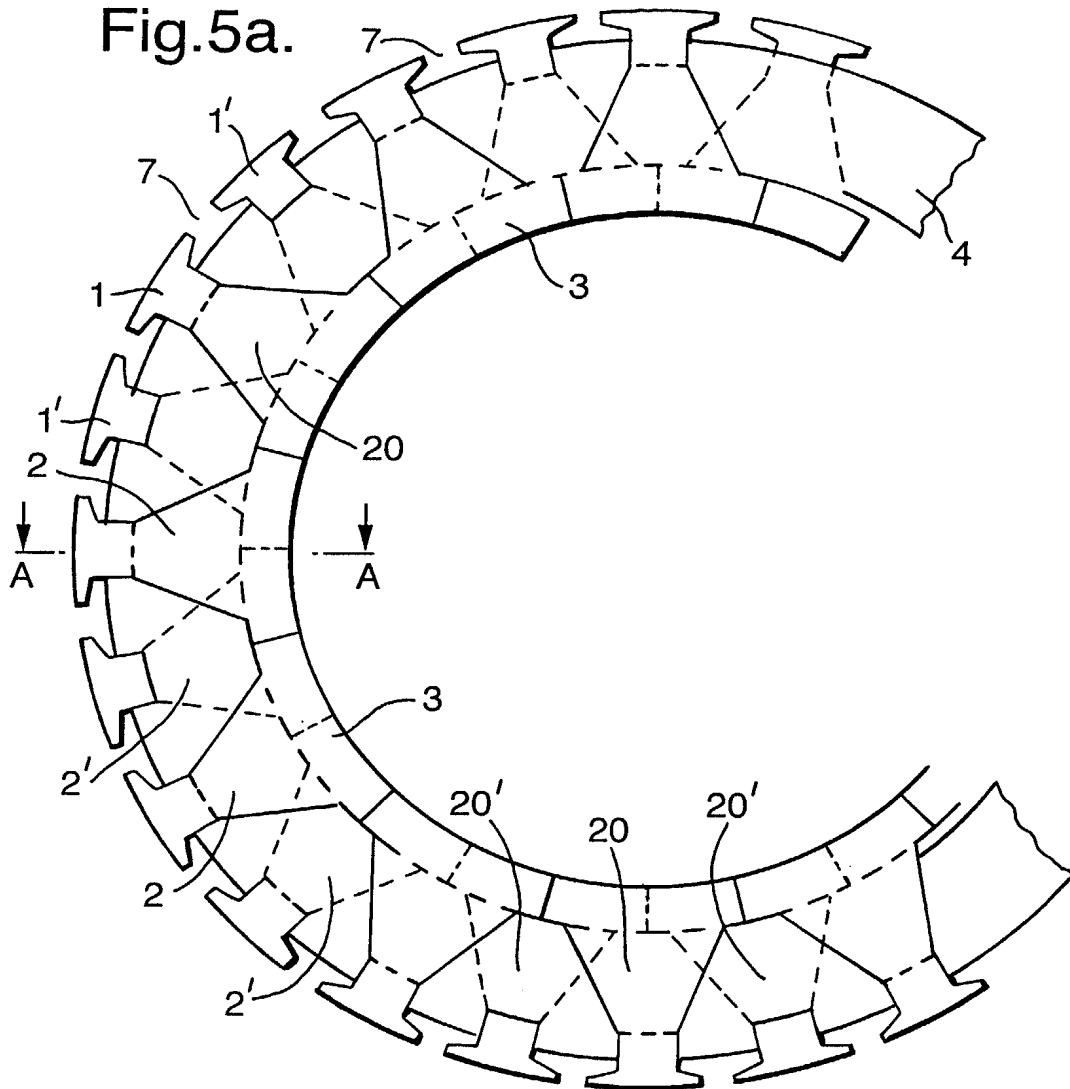
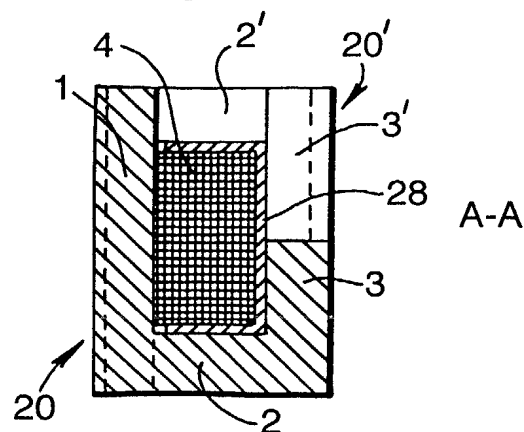


Fig.5b.



4/6

Fig. 6b.

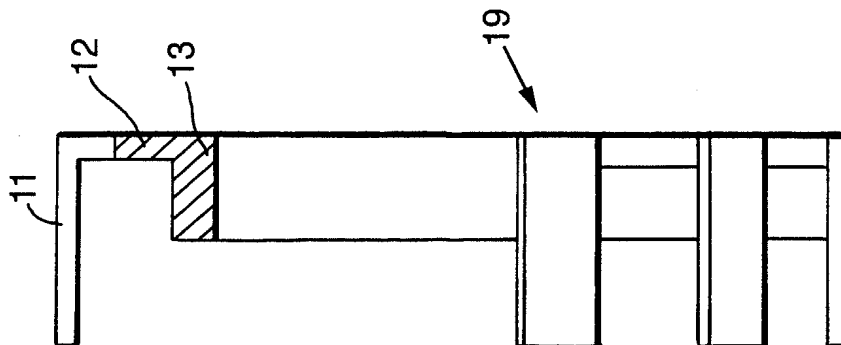
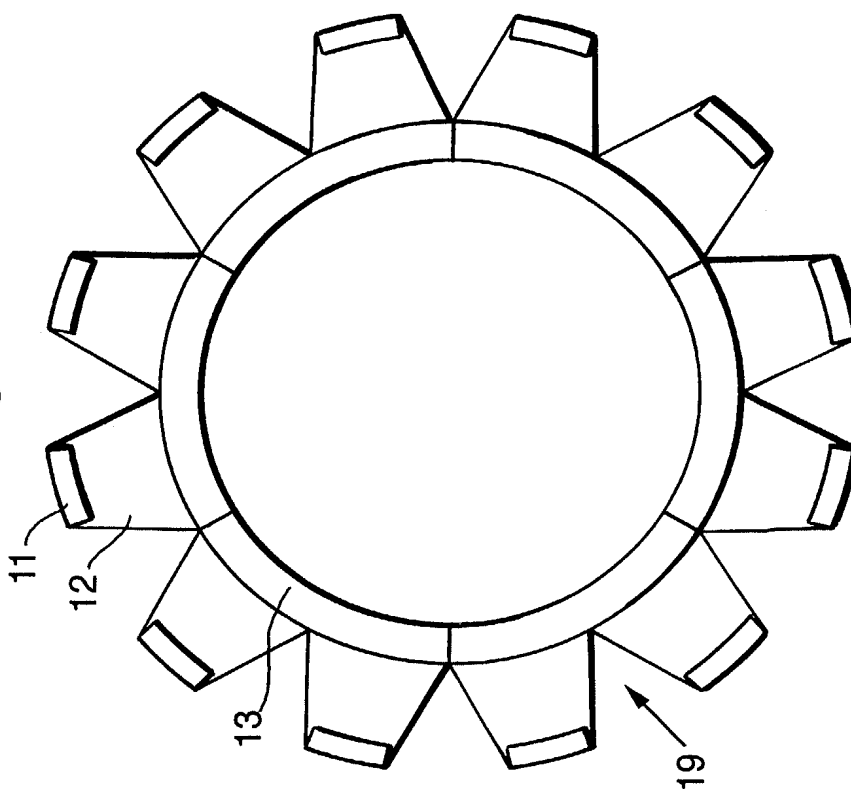


Fig. 6a.



5/6

Fig.8a.

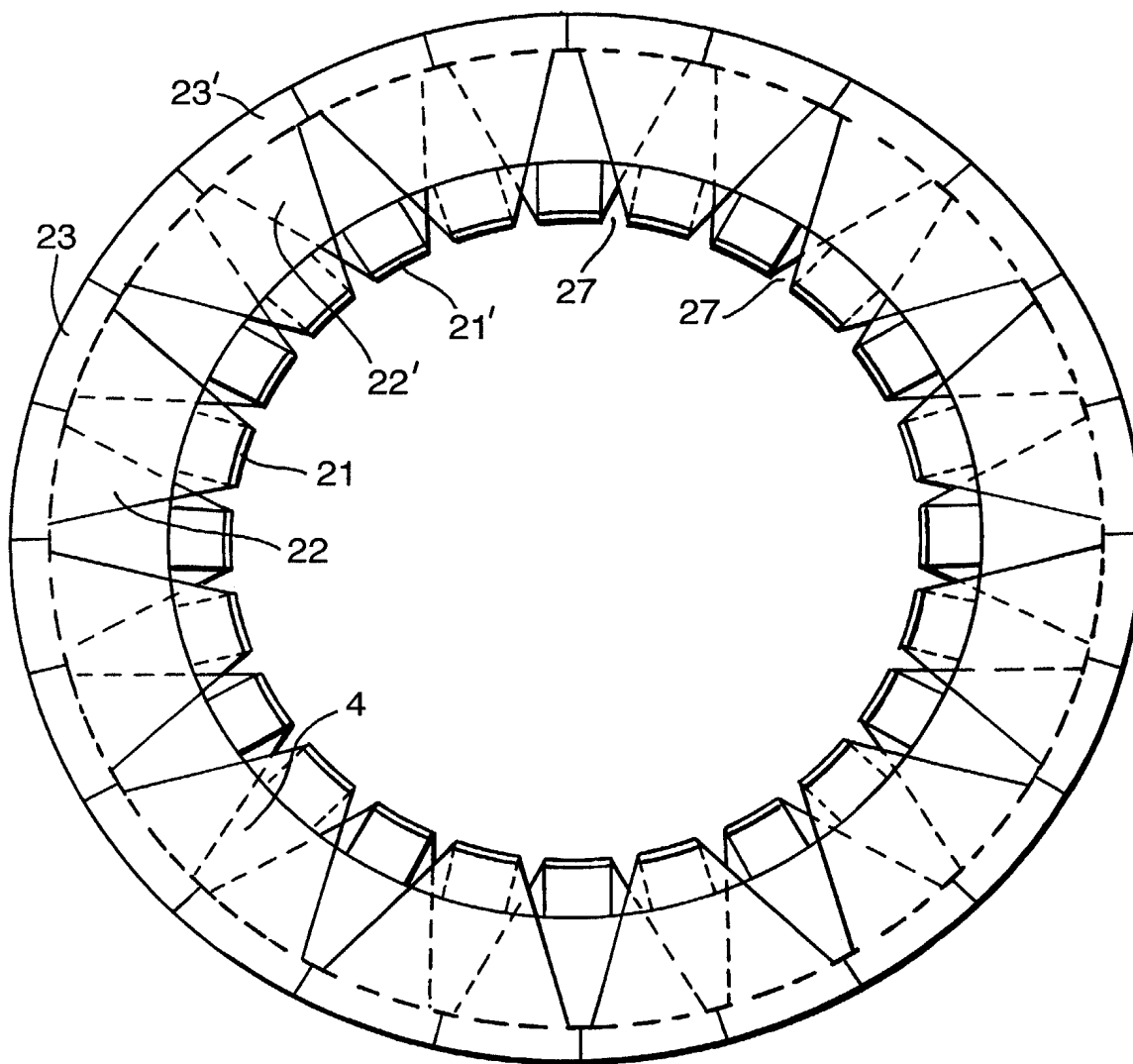
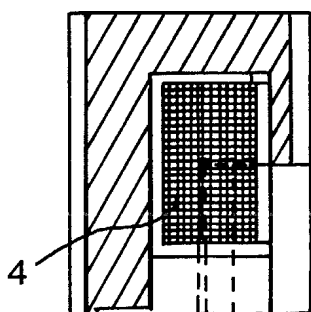
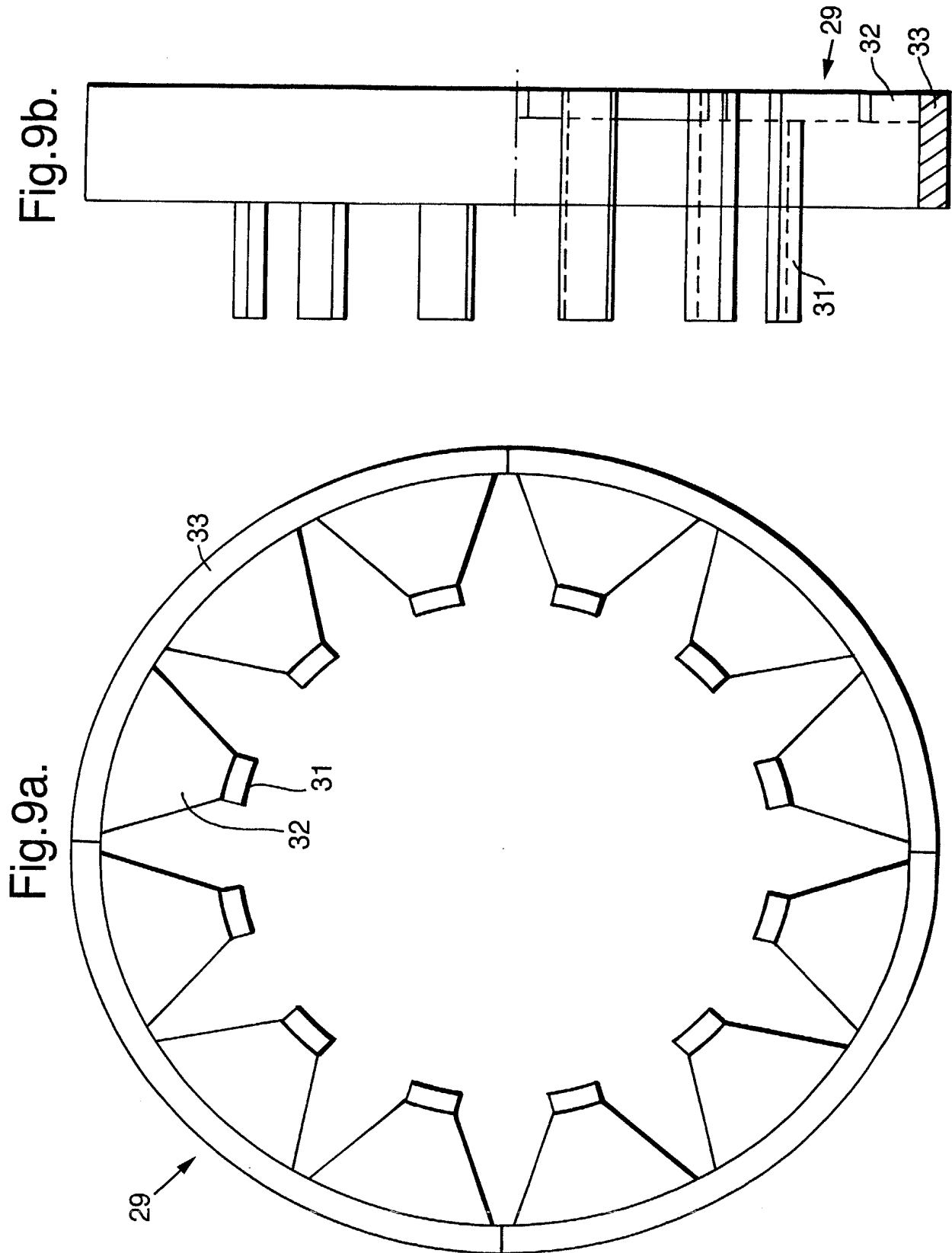


Fig.8b.



6/6



Stator i roterende elektrisk maskin

Foreliggende oppfinnelse vedrører sentrale deler av en elektrisk rotasjonsmaskin, dvs. motor eller generator, nærmere bestemt en trinnmaskin. De deler oppfinnelsen angår, er en sentralt eller perifert anbrakt stator, samt konstruksjons-
5 deler som bygger opp statoren.

En maskin som omfatter tekniske trekk beslektet med herværende oppfinnelse, er kjent fra norsk patent nr. 174947. I dette patentet vises, se fig. 1, 2 og 3 vedføydd her, et system av "fingre" 5,6 som fungerer som fluksledere rundt stator-
ens spole eller spoler, og som tilveiebringer omkretsmessig rettet magnetisk fluks i
10 utvendige gap 7 mellom slike "ytte fingerledd" 15, 17 som peker i suksessivt motsatt akseparallellell retning, for vekselvirkning mellom disse magnetfeltene og magnetfelter fra permanentmagneter 9 på innsiden av en utvendig, konsentrisk anbrakt rotor 10. En slik motor kan kalles en transversalfluks-maskin, fordi magnetfluksen hovedsakelig går transversalt, dvs. akseparallellellt innvendig for den ringformede
15 spolen, så radialell ved siden av spolen, så hovedsakelig akseparallellellt igjen på utsiden av spolen, og endelig radialell tilbake igjen på den andre siden av spolen.

I NO 174947 omtales "fingrene" 5, 6 som "lamellblokker" bestående av tynne blikk. Disse lamellblokkene står i fysisk kontakt med en separat spolekjerne 8 som ligger radialell innenfor den aktuelle spolen (ikke vist). Fremstillingen
20 av spolekjerne og lamellblokker, og sammensetningen av disse, er imidlertid vanskelig og kostnadskrevennde.

Foreliggende oppfinnelse tar sikte på å tilveiebringe en mer fordelaktig konstruksjon av "fingerstrukturen" i maskinens stator, både teknisk og økonomisk.

I samsvar med et første aspekt av oppfinnelsen er det derfor tilveiebrakt et
25 statorelement for bruk i en roterende elektrisk maskin som fortrinnsvis er av transversalfluks-type, og statorelementet kjennetegnes ved at det er utført med en polsko, et fluksførende parti og en spolekjernedel integrert i ett stykke, med det fluksførende partiet mellom polsko og spolekjernedelen.

I en foretrukket utførelsesform har statorelementets polsko langstrakt form i
30 en retning parallellell med maskinens akse, med lengde tilnærmet det dobbelte av

spolekjernedelens lengde i samme retning, idet det fluksførende partiet er perpendikulært på både polsko og spolekjernedel og festet til en ende av hver av disse slik at både polsko og spolekjernedel peker i samme retning.

Fortrinnsvis har spolekjernedelen en vinkelmessig utstrekning på $360^\circ/n$ i rotasjons-dreieretningen, hvor n angir antallet omkretsmessig sidestilte statorelementer som til sammen kan utgjøre en fullstendig statordel.

Statorelementet er i den foretrukne utførelsesform utformet av presset og varmebehandlet jernpulvermateriale.

I samsvar med et andre aspekt av oppfinnelsen er det tilveiebrakt en statordel for bruk i en roterende elektrisk maskin som fortrinnsvis er av transversalfluks-type. Statordelen kjennetegnes ved at den utgjøres av et antall n statorelementer av den type som er angitt i det ovenstående, anbrakt i ringstruktur slik at n parallelle polsko peker finger-lignende i en retning parallelt med maskinens rotasjonsakse og ligger radielt utvendig eller innvendig, mens de tilsvarende n spolekjernedelene ligger radielt innvendig eller utvendig for sammen å utgjøre minst en del av en spolekjerne, og alle de n fluksførende partiene ligger på samme aksiale side av spolekjernen.

I samsvar med et tredje aspekt av oppfinnelsen er det tilveiebrakt en statordel for bruk i en roterende elektrisk maskin som fortrinnsvis er av transversalfluks-type. Statordelen omfatter en ringformet struktur som består av

- en spolekjertering for understøttelse av en ringformet spole med radial og aksial utstrekning,
- et fluksførende område som strekker seg radially fra en kant av spolekjerteringen til en radial posisjon noe forbi spolens radiale utstrekning, samt
- et antall n adskilte polsko som strekker seg i aksial retning fra det fluksførende området ved dets nevnte radiale posisjon og i retning tilbake over spolen.

Statordelen ifølge det tredje aspekt kjennetegnes ved at

- den ringformede strukturen utgjøres av en samling av flere omkretsvis sidestilte og separat fremstilte statorelementer som hvert er en integrert enhet med
- minst én polsko,
- ett fluksførende parti for hver polsko, hvor alle disse n partiene til sammen utgjør nevnte fluksførende område, og

- en spolekjernedel, hvor spolekjernedelene ligger tett inntil hverandre og sammen utgjør spolekjerneeringen, og ved at
- hvert fluksførende parti er utformet slik at det er klar avstand mellom nabo-partier helt fra spolekjernedelen og til polsko.

5 I en utførelsesform tilpasset en maskin med utvendig rotor, er polskoene i statordelen anbrakt radielt utvendig. I en "motsatt" utførelsesform hvor maskinen er av en type med innvendig rotor, er statordelens polsko anbrakt radielt innvendig.

10 I en foretrukket utførelsesform er statordelens statorelementer utformet av presset og varmebehandlet jerpulvermateriale.

I samsvar med et fjerde aspekt av oppfinnelsen er det tilveiebrakt en stator for bruk i en roterende elektrisk maskin som fortrinnsvis er av transversalfluks-type. Statoren omfatter minst ett par ringformede statordeler og minst en spole, hvor to statordeler i et par er anbrakt aksialt sidestilt på samme akse og med polsko pekende i motsatte retninger og inn mellom hverandre på regulært interfoliert 15 måte, slik at det dannes like store, åpne fluksgap mellom alle $2n$ polsko, og spolen ligger i et ringrom som dannes mellom de to statordelene i paret. Statoren ifølge oppfinnelsens fjerde aspekt kjennetegnes ved at statordelene er like og av sammensatt type slik som angitt ovenfor, idet spolekjernedelene samlet utgjør en 20 kjerne for spolen, isolert fra spolen med en hovedsakelig ringformet støttestruktur for statordelen, laget f.eks. av et plastmateriale.

I en utførelsesform hvor maskinen er av typen med utvendig rotor, er statorens polsko anbrakt radielt utvendig. I en "motsatt" utførelsesform hvor maskinen er av typen med innvendig rotor, er statorens polsko anbrakt radielt innvendig.

25 I det følgende skal oppfinnelsen belyses nærmere ved en detaljert beskrivelse av de utførelsesformer av oppfinnelsen som fremgår av de vedføyde tegningene, hvor

fig. 1, 2 og 3 viser elementer av tidligere kjent teknikk,

30 fig. 4 viser en foretrukket utførelsesform av et statorelement ifølge oppfinnelsen,

fig. 5a viser en utførelsesform av en stator, nemlig sammensatt av statorelementer av den type som vises i fig. 4,

fig. 5b viser et snitt gjennom statoren som vises i fig. 5a,

fig. 6a viser en utførelsesform av en sammensatt statordel ifølge oppfinnelsen, i planriss,

fig. 6b viser samme del som fig. 6a, men i delvis sideriss og delvis snitt,

5 fig. 7 viser en utførelsesform av et statorelement til bruk i en maskin med innvendig rotor,

fig. 8a og 8b viser på tilsvarende måte som fig. 5a og 5b en utførelsesform av en stator beregnet for en maskin med innvendig rotor, og

10 fig. 9a og 9b viser på omtrent samme måte som fig. 6a og 6b en utførelsesform av en sammensatt statordel, men for bruk i en maskin med innvendig rotor.

I fig. 1, som også er omtalt innledningsvis, fremgår skjematisk en maskinløsning som er kjent fra ovennevnte norske patent nr. 174947. En ytre rotor 10, f.eks. en hjulfelg eller lignende har på sin innside et arrangement av permanentmagneter 9, som vi ikke går nærmere inn på her. Disse permanentmagnetene 9 vekselvirker med variable magnetfelter på en innenforliggende stator 18, hvilke
15 variable magnetfelter går tvers over gapene 7 mellom radielt ytre "fingerledd" 15, 17 av "fingre" 5, 6 med "stammer" 14, 16, se også fig. 2 og 3, som viser "fingrene" 5 og 6 fra siden. "Fingrene" 5 har Γ -form, og "fingrene" 6 har T-form. Hver "finger"-struktur 5, 6 er fortrinnsvis en stabel av tynne blikk, slik det fremgår av
20 fig. 1.

Radielt innerst ligger "fingrene" 5, 6 i den tidligere kjente anordningen tett inntil en spolekjerne 8, og i rommet radielt utenfor spolekjernen 8 og innenfor "finger-ytterleddene" 15, 17 befinner det seg en (ikke vist) spole, som når den energiseres, gir opphav til magnetfluks som følger "fingrene" fra spolekjernen og krysser
25 gapene 7 mellom motsatt pekende "finger-ytterledd" 15, 17.

I den motor-utførelsesform som fremgår av NO 174947, inngår det minst to slike spoler, og derfor står en T-formet "fingerdel" 6 mellom to spoler og strekker "finger-ytterledd" 17 ut i to retninger. Fig. 1 viser en slik struktur, men figuren kunne forsåvidt like gjerne vise en enklere struktur med bare en spole, dvs. med
30 bare en "finger-type" slik som vist med referansetall 5, dvs. referansetall 6 og 17 kan da i fig. 1 byttes ut med referansetall 5 og 15.

I fig. 5a vises en struktur som har samme funksjon som statoren 18 i fig. 1. Denne strukturen er sammensatt av mindre deler, nemlig slike statorelementer 20 som vises i fig. 4.

Den foretrukne utførelsesform av et statorelement ifølge et aspekt av oppfinnelsen vises i fig. 4, sett i to ortogonale retninger. Det fremgår at statorelementet i utgangspunktet er laget for sammen med flere tilsvarende elementer å utgjøre en statordel, dvs. en aksiell "side" av den komplette struktur som må til for å slutte fluks-kretsene rundt en spole. Derfor er elementet 20 gitt en form tilpasset en sirkelsektor med vinkel A, hvor $n \cdot A = 360^\circ$, med $n = \text{antall slike elementer 20 som tilsammen danner en sirkel.}$

En øvre "ytte fingerledd"-del 1 er laget for å strekke seg på tvers over spolen, dvs. i en retning som er parallell med maskinens akse. Lengden av delen 1, som utgjør en polsko, er fortrinnsvis dobbel så lang som nedre/indre del 3 i samme retning, dvs. $D \approx 2C$. Delen 3 utgjør en spolekjernedel, dvs. den inngår som en del av og danner derved, selve spolekjernen når hele strukturen er samlet.

Mellompartiet 2 benevnes "et fluksførende parti", og alle partier 1, 2, 3 er fremstilt som ett integrert stykke 20. Fortrinnsvis presses og varmebehandles et slikt stykke frem av jernpulvermateriale.

En ser at en viss formgivning er gunstig, f.eks. er den radielt ytre overflate av polskolen 1 sylinderformet for å tilpasses nær passasje av en utenforliggende rotor, og for å utgjøre en del av en tenkt ytre sylinderflate for statoren.

Når en så ser på strukturen i fig. 5a, fremgår det at et antall n , i det viste tilfellet $n=12$, statorelementer 20 er samlet til en ringformet struktur for å utgjøre en statordel, dvs. en slik "aksiell side" av en komplett stator-struktur som er omtalt tidligere, og som har "ytte fingerledd", dvs. polsko, som peker i bare én akse-parallell retning. Slike statorelementer som her vises med referansetall 20, tilhører således én statordel, mens de statorelementene som benevnes 20', er statorelementer "på baksiden", dvs. anordnet som en sidestilt statordel på den andre siden av en spole.

I fig. 5b vises en spole 4 som ligger inne i det ringformede rom som dannes av to inntil hverandre sidestilte statordeler, idet fig. 5b viser snittet A-A som angis i fig. 5a. En støtte- og isolasjonsstruktur 28 antydes også i figuren. En slik støtte-

struktur kan forøvrig være mer detaljpreget og profilert enn det som vises her, for å ta hensyn til krav som det ikke har noen hensikt å omtale nærmere her, f.eks. i forbindelse med montasjearbeid, tilknytning til ytterligere enheter, ledningsgjennomføringer etc. En ser i snittfiguren i fig. 5b ett statorelement 20 som er skravert, med polsko 1 fluksførende parti 2 og spolekjernedel 3, og en ser videre delene 2' og 3' tilhørende neste, bakenforliggende statorelement 20', mens polskoen 1' er skjult bak polskoen 1.

Tilsammen danner nå de viste elementene en prinsipielt komplett stator (det som ikke vises, er eiker inn til et sentralt nav, tilledninger etc.).

Dersom totaldimensjonene er tilstrekkelig små, vil det være mulig å lage en helintegrert statordel, som tilsvarende en av de to sammensatte statordelene som vises i fig. 5a, og som vi husker består av statorelementer 20 som hvert for seg er framstilt som integrerte enheter. Fig. 6a viser imidlertid en utførelsesform som er sammensatt av seks enheter, med to polsko pr. enhet. Tilsvarende geometri som for et detaljert sammensatt statorelement kan da lages, med en sammensatt, ringformet spolekjernedel 13 (som da utgjør en halv spolekjerne), et antall fluksførende partier 12 som rager radialet utad, her vist tolv slike partier 12, og derpå festede polsko 11 som peker i en og samme akselparallelle retning, det hele sammensatt av seks enheter som hver for seg er presset og varmebehandlet som ett stykke under fremstillingen.

I fig. 6b vises samme statordel fra siden, delvis i snitt, og formen ses å tilsvarende den tidligere beskrevne, sammensatte form som vises i fig. 5a og 5b.

I en ferdig sammenstilt statordel, jfr. fig. 5a, vil en typisk gap-avstand være gitt av maskinens anvendelsesområde. Ønskes høye turtall og lave tap, økes gapet, og ønskes høyt moment, lave turtal i og en kompakt maskin, reduseres gapet. Antallet polsko kan i utgangspunktet velges fritt, typisk antall kan være 24 stykker.

I stedet for presset og varmebehandlet jernpulver kan man fremstille de integrerte enhetene av bløtt jern eller annet magnetisk ledende materiale.

I et mellomliggende dimensjonsområde kan man forøvrig benytte en enda mer integrert type enn den sammensatte statordelen 19 som vises i fig. 6a, nemlig en løsning hvor f.eks. en sirkelkvadrant med f.eks. tre polsko lages som en integrert enhet ved pressing og varmebehandling, og settes sammen med ytterligere

tre slike enheter for å danne en fullstendig og ringformet statordel. Dette vises i fig. 9. Andre oppdelingsforhold enn kvadrant-sektorer kan selvfølgelig være like aktuelle.

Fortrinnsvis er statorelementet, statordelen og statoren ifølge oppfinnelsen
5 ment å benyttes i en roterende elektrisk maskin av transversalfluks-type. Dette er en slik maskin hvor magnetfluksen skapt av statorens spole ledes akseparallelt, radialt, hovedsakelig akseparallelt og radialt igjen rundt spolen av et omsluttende "statorhus", slik som nevnt i innledningen, og vekselvirker med magnetfelt fra en rotor anbrakt konsentrisk utenfor eller innenfor statoren.

10 En enkelt elektrisk generator kan konstrueres omkring en eneste spole 4, dvs. med bare en ringformet statordel på hver side og med polsko/"fingre" som går mot og mellom hverandre på spolens radiale utside, og med en drevet rotor konsentrisk utenpå.

For å lage en elektrisk motor av generelt samme type som i NO 174947,
15 må det nettopp omtalte oppsettet dobles, dvs. man må ha to sidestilte spoler med tilsvarende omgivende statordeler, og den utenforliggende rotoren, som kan drives ved hjelp av styrt vekselstrøm i spolene, har da innvendig anbrakte magneter i henhold til et skjema som angitt i NO 174947. Det er ikke nødvendig å gå nærmere inn på slike skjemaer i beskrivelsen av herværende oppfinnelse.

20 Det foreligger selvfølgelig mulighet for en fullstendig omvending av de strukturer som til nå har vært detaljert omtalt, dvs. en omvending på en slik måte at rotoren befinner seg konsentrisk innvendig, mens statoren ligger utvendig og har sin spolekjerne aller ytterst, og de omtalte "fingrene"/polskoene beliggende radialt innenfor spolen. Det vises til fig. 8a, som på tilsvarende måte som fig. 5a
25 viser en "komplett" stator med to sidestilte statordeler. Forskjellen er her at polskoene 21 ligger radialt innvendig, mens spolekjernedelene 23 ligger radialt utvendig. På samme måte som tidligere befinner det fluksførende partiet 22 seg mellom spolekjernedelen 23 og polskoene 21, og binder disse sammen, dvs. statorelementet er et integrert hele.

30 De enkelte statorelementer vises i denne "omvendte" utførelse i fig. 7, sett i to ortogonale retninger.

Fig. 8b viser på tilsvarende måte som fig. 5b hvordan spolen 4 ligger i det ringformede hulrommet som dannes mellom de to sidestilte statordelene.

Fig. 9a og 9b kan sammenlignes med fig. 6a og 6b, og viser som før nevnt en statordel 29, analogt med den sammensatte statordelen 19, men altså i "om-
s vendt" utførelse med komplett ringformet spolekjernedel 33 radielt utvendig, polsko 31 radielt innerst (mot en ikke vist rotor i sentrum) og fluksførende parti 32 mellom disse, men her bestående av fire integrerte stykker med tre polsko på hvert stykke.

I fig. 8a benyttes merkede henvisningstall om tilsvarende detaljer som de
10 som er vist umerket, men tilhørende den sidestilte (bakenforliggende) statordelen. Referansetall 27 viser til gapet mellom motsatt pekende polsko.

PATENTKRAV

1. Statorelement for bruk i en roterende elektrisk maskin som fortrinnsvis er av transversalfluks-type,
5 k a r a k t e r i s e r t v e d at statorelementet er utført med en polsko (1), et fluksførende parti (2) og en spolekjernedel (3) integrert i ett stykke, med det fluksførende partiet (2) mellom polskoen (1) og spolekjernedelen (3).
2. Statorelement ifølge krav 1,
10 k a r a k t e r i s e r t v e d at polskoen (1) har langstrakt form i en retning parallelt med maskinens akse, med lengde tilnærmet det dobbelte av spolekjernedelens (3) lengde i samme retning, idet det fluksførende partiet (2) er perpendikulært på både polsko (1) og spolekjernedel (3) og festet til en ende av hver av disse slik at både polsko (1) og spolekjernedel (3) peker i samme retning.
15
3. Statorelement ifølge krav 1 eller 2,
k a r a k t e r i s e r t v e d at spolekjernedelen (3) har en vinkelmessig utstrekning på $360^\circ/n$ i rotasjons-dreieretningen, hvor n angir antallet omkretsmessig sidestilte statorelementer som til sammen kan utgjøre en fullstendig statordel.
20
4. Statorelement ifølge krav 1, 2 eller 3,
k a r a k t e r i s e r t v e d at det er utformet av presset og varmebehandlet jernpulvermateriale.
- 25 5. Statordel for bruk i en roterende elektrisk maskin som fortrinnsvis er av transversalfluks-type,
k a r a k t e r i s e r t v e d at den utgjøres av et antall n statorelementer av den type som angis i et av kravene 1-4, anbrakt i ringstruktur slik at n parallelle polsko (1) peker finger-lignende i en retning parallelt med maskinens rotasjonsakse og
30 ligger radielt utvendig eller innvendig, mens de tilsvarende n spolekjernedelene (3)

ligger radielt innvendig eller utvendig for sammen å utgjøre minst en del av en spolekjerne, og alle de n fluksførende partiene (2) ligger på samme aksiale side av spolekjernen.

- 5 6. Statordel for bruk i en roterende elektrisk maskin som fortrinnsvis er av transversalfluks-type, omfattende en ringformet struktur som består av
- en spolekjerne for understøttelse av en ringformet spole (4) med radial og aksial utstrekning,
 - et fluksførende område som strekker seg radially fra en kant av spolekjerne-
10 ringen til en radial posisjon noe forbi spolens (4) radiale utstrekning, samt
 - et antall n adskilte polsko (11, 21) som strekker seg i aksial retning fra det fluksførende området ved dets nevnte radiale posisjon og i retning tilbake over spolen (4),
- karakterisert ved at
- 15 - den ringformede strukturen (11, 21, 12, 22, 13, 23,) utgjøres av en samling av flere omkretsvis sidestilte og separat fremstilte statorelementer som hvert er en integrert enhet med
- minst én polsko (11, 21),
 - ett fluksførende parti (12, 22) for hver polsko, hvor alle disse n partiene
20 (12, 22) tilsammen utgjør nevnte fluksførende område, og
 - en spolekjernedel (13, 23), hvor spolekjernedelene (13, 23) ligger tett inntil hverandre og sammen utgjør spolekjerneeringen, og ved at
 - hvert fluksførende parti (12, 22,) er utformet slik at det er klar avstand mellom nabopartier helt fra spolekjernedelen (13, 23) og til polskoene
25 (11, 21).

7. Statordel ifølge krav 6,
karakterisert ved at polskoene (11) er anbrakt radielt utvendig, hvorved maskinen er av typen med utvendig rotor.

8. Statordel ifølge krav 6,
k a r a k t e r i s e r t v e d at polskoene (21) er anbrakt radielt innvendig,
hvorved maskinen er av typen med innvendig rotor.
- 5 9. Statordel ifølge krav 6, 7 eller 8,
k a r a k t e r i s e r t v e d at hvert statorelement er utformet av presset og
varmebehandlet jernpulvermateriale.
- 10 10. Stator for bruk i en roterende elektrisk maskin som fortrinnsvis er av trans-
versalfluks-type, omfattende minst ett par ringformede statordeler og minst en
spole (4), hvor to statordeler i et par er anbrakt aksialt sidestilt på samme akse og
med polsko (1, 11, 21) pekende i motsatte retninger og inn mellom hverandre på
regulært interfoliert måte, slik at det dannes like store, åpne fluksgap mellom alle
2n polsko (1, 11, 21), hvor spolen (4) ligger i et ringrom som dannes mellom de to
15 statordelene i paret,
k a r a k t e r i s e r t v e d at statordelene er like og av den type som angis i krav
5 eller 6, idet spolekjernedelene (3, 13, 23) samlet utgjør en kjerne for spolen (4),
isolert fra spolen (4) med en hovedsakelig ringformet støttestruktur (28) for stator-
delen, laget f.eks. av et plastmateriale.
- 20 11. Stator ifølge krav 10,
k a r a k t e r i s e r t v e d at polskoene (1,11) er anbrakt radielt utvendig, hvor-
ved maskinen er av typen med utvendig rotor.
- 25 12. Stator ifølge krav 10,
k a r a k t e r i s e r t v e d at polskoene (21) er anbrakt radielt innvendig, hvor-
ved maskinen er av typen med innvendig rotor.

SAMMENDRAG

I en roterende elektrisk maskin av transversalfluks-type med minst to fluks-
ledende og hovedsakelig ringformede statordeler som sammen omgir en ringfor-
met spole og oppviser interfolierte, finger-liknende polsko, og derved utgjør hoved-
5 deler av en stator som en konsentrisk anbrakt, ringformet rotor med permanent-
magneter kan dreie seg i forhold til, er sektorer av statordelene eller i det minste
en minste enhet (20) som omfatter en polsko (1), en tilhørende spolekjernedel (3)
og et fluksførende parti (2) som sammenbinder polskoen (1) og spolekjernedelen
(3), utført som ett integrert materialstykke.



PATENTSTYRET
Styret for det industrielle rettsvern

NORSK GRANSKINGSRAPPORT
NORWEGIAN SEARCH REPORT

Patentsøknad nr.
Patent application no.

19991395

Kategori/ Category*	Anførte publikasjoner: Cited documents:	Relevant mot krav Relevant to claim(s)
Y	EP 0 568 347 A1 (Hele dokumentet)	1, 4, 5, 6, 8, 9, 10, 12
Y	US 4 794 292 (Hele dokumentet)	1, 5, 6, 10
Y, D	NO 174 947 C (Hele dokumentet)	1, 5, 6, 10
*Dokumentkategori: X: særlig relevant alene Y: særlig relevant dersom det kombineres med annet dokument i samme kategori A: bakgrunns-teknikk D: anført i beskrivelsen E: dokument med tidligere prioritet (PL § 2.2.3) &: publisasjon i samme patentfamilie		*Category of cited document: X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background D: document cited in the application E: earlier patent document, but published on, or after the filing date &: member of the same family

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PATENTSTYRET
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NORWEGIAN SEARCH REPORT
Tilleggsrapport
Additional report

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Kategori/ Category*	Anførte publikasjoner: Cited documents:	Relevant mot krav Relevant to claim(s)
X	US 5 708 318 (Hele dokumentet)	5, 6, 10
*Dokumentkategori: X: særlig relevant alene Y: særlig relevant dersom det kombineres med annet dokument i samme kategori A: bakgrunnsteknikk D: anført i beskrivelsen E: dokument med tidligere prioritet (PL § 2.2.3) &: publikasjon i samme patentfamilie		*Category of cited document: X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background D: document cited in the application E: earlier patent document, but published on, or after the filing date &: member of the same family

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